

Amendments to the Specification:

Please amend the **ABSTRACT**, on page 15 of the specification, as follows:

ABSTRACT

[PROBLEMS] To provide a A multifunction vibration actuator is disclosed, which is capable of maintaining high tone quality and output by increasing a frequency band with an elliptic diaphragm, reducing labor and cost in assembly, and increasing the space efficiency thereof in equipment in which the actuator is mounted. [MEANS FOR SOLVING PROBLEMS] This actuator comprises includes a housing (1) integrally formed with a first house part (1a) with an elliptic wall (10), a second house part (1b) having a cylindrical wall (11) with a diameter corresponding to the first house part (1a) at the center of the ellipse, and both bottom walls (1c) and (1d) of the first housing part (1a). The actuator also comprises includes an elliptic diaphragm (3) with an annular voice coil (3) installed on the inner surface thereof, a circular magnetic circuit part (4), and a disk type suspension (5). The elliptic diaphragm (3) is tightly installed in the wall of the first house part (1a), and the circular magnetic circuit part (4) is installed in the cylinder of the second house part (1b) with the suspension (5).

[REPRESENTATIVE FIGURE] Fig. 10

On page 1 of the specification, please amend the heading before paragraph 0001, as follows:

TECHNICAL FIELD-BACKGROUND

(1) Field of the Invention

On page 1 of the specification, please amend the heading before paragraph 0002, as follows:

BACKGROUND ART

(2) Description of the Related Art

On page 1 of the specification, please amend paragraph 0003, as follows:

[0003]

In order to satisfy the requirement, a unit equipped with an elliptic diaphragm that is smaller than a circular diaphragm in width is proposed while keeping almost the same total area (~~Patent reference 1 and 2~~). See, for example, JP2000-201396A and JP2002-307013A.

On page 1 of the specification, please delete the following references after paragraph 0005, as follows:

~~[Patent reference 1] JP2000-201396A~~

~~[Patent reference 2] JP2002-307013A~~

On page 2 of the specification, please amend the heading just before paragraph 0006, as follows:

BRIEF SUMMARY DISCLOSURE-OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

Please amend the specification starting with heading on page 2 just prior to paragraph 0008 to the end of paragraph 0022 on page 5, as follows:

MEANS FOR SOLVING THE PROBLEM

[0008]

Claim 1 Embodiments of the invention ~~provides~~ provide a multifunction-type vibration actuator comprising a magnetic circuit part assembled with a thin, plate-like diaphragm to an inner surface of which a voice coil, yoke, magnet, pole piece, and a leaf spring-like suspension for holding the circuit part is installed, wherein the magnet circuit part is assembled inside a wall of a housing with the suspension; the voice coil is inserted into a magnetic gap of the magnetic circuit part so that the diaphragm fits tightly inside the wall of the housing, and the voice coil is electrically connected to an external terminal with lead wires pulled out to an outside of the wall; and also comprising a housing integrally formed

with a first house part with an elliptic wall and a second house part with a cylindrical wall of which a diameter corresponds to a width of the first house part at a center of a ellipse at both bottom walls of the first house part, an elliptic diaphragm to which an inner surface of an annular voice coil is installed, a circular magnetic circuit part provided with a magnetic gap into which the voice coil is inserted, and a disk-shaped suspension, wherein the elliptic diaphragm fits tightly inside a wall of the first house part, and the circular magnetic circuit part is assembled in a cylinder of the second house part with the suspension.

[0009]

Other embodiments Claim 2 of the invention provides provide a multifunction-type vibration actuator comprising an elliptic diaphragm on a plate surface, which is provided with a plurality of V-grooves that radially extend at the same angle from a dome-shaped part surrounded by an annular voice coil at a center of a plate surface and that are long on the semicircular plate surfaces located at both sides in the longitudinal direction and short on the plate surfaces located at both sides in the lateral direction.

[0010]

Other embodiments Claim 3 of the invention provides provide a multifunction-type vibration actuator comprising an elliptic diaphragm, wherein lead wires of the voice coil are pulled out toward both sides while divided into positive and negative poles on a same semicircular plate surface from a dome-shaped part at a center of the plate surface.

[0011]

In other embodiments Claim 4 of the invention, provides a multifunction-type vibration actuator-is can be equipped with a suspension that comprises a central ring part for holding a circular magnetic circuit part and three arm parts circumferentially extending in the same direction with a same length from the proximal ends of the arms located apart from each other at an angle of 120.degree. on the ring part, wherein the distal end of one of the arm parts extending outward from the second house part is fitted and fixed in a dent located in the middle of one of bottom wall surfaces, and the distal ends of the remaining two arm parts extending outward from the second house part are fitted and fixed in dents located at both sides of another bottom wall surface of the first house part.

[0012]

In another embodiment Claim 5, of the invention provides a multifunction-type vibration actuator is equipped with a suspension having three arm parts of which the distal ends are formed in different shapes, wherein dents corresponding to a shape of each arm distal end are provided in a bottom wall surface of the first house part to install the suspension in a cylinder of the second house part by fitting the distal ends of the arms in the dents.

[0013]

In other embodiments Claim 6 of the invention, provides a multifunction-type vibration actuator, wherein an external terminal electrically connected to a voice coil is formed with a printed circuit board, and the printed circuit board is installed to a bottom wall surface opposite to a diaphragm fitted surface at one of the bottom walls of the first house part.

[0014]

Claim 7 Another embodiment of the invention provides portable communication equipment mounted with a multifunction-type vibration actuator according to one of the embodiments described above claims 1 through 6.

EFFECTS OF THE INVENTION

[0015]

Since a multifunction-type vibration actuator according to claim 1 embodiments of the invention comprises an elliptic diaphragm fit tightly in an elliptic wall of a first house part and, on the other hand, a circular magnetic circuit part assembled inside a cylindrical wall of a second house part with a suspension, an elliptic diaphragm with a large diameter enables to an increase increased frequency band to improve tone and output as a speaker function, and moreover since the actuator contains the suspension and the circularly formed magnetic circuit part, the labor for forming, installing, and assembling components, as well as the cost for manufacturing parts, can be reduced.

[0016]

In addition, since an embodiment may include the a second house part with the cylindrical wall having a diameter corresponding to the lateral dimension of the first house part is provided in the equipment, the bottom wall spaces of the first house part extending to both sides of the second house part can be used as mounting spaces for other parts, the elliptic wall of the first house part can contribute to reducing the dimension in the lateral direction,

and moreover, spatial efficiency for devices to be mounted inside the equipment can be improved.

[0017]

Since a multifunction-type vibration actuator according to ~~claim-2~~ an embodiment of the invention is may be equipped with a diaphragm having a plate surface on which radial V-grooves are provided in the tangential direction at the same angle to a vibration part at the center of the plate surface, a phase shift of sound wave transmitted to the plate surface can be prevented to maintain high tone quality and output as a speaker function, and moreover, since the above-mentioned V-grooves are long on the semicircular plate surfaces located at both sides in the longitudinal direction and short on the plate surfaces located at both sides in the lateral direction, the diaphragm can secure sufficient rigidity even if the diaphragm is formed in an elliptic shape.

[0018]

A multifunction-type vibration actuator according to ~~claim-3~~ an embodiment of the invention equipped with an elliptic diaphragm provided with a voice coil of which lead wires are pulled out toward both sides while divided into positive and negative poles on the same semicircular plate surface from a dome-shaped part at the center of the plate surface keeps the weight balance of the diaphragm equal for equipment having high tone quality and output.

[0019]

In a multifunction-type vibration actuator according to ~~claim-4~~ an embodiment of the invention, since a distal end of one of the arm parts extending outward from the second house part is fitted and fixed in a dent located in the middle of one of the bottom wall surfaces and distal ends of the remaining two arm parts extending outward from the second house part are fitted and fixed in dents located at both sides of another bottom wall surface of the first house part, increase of the width in the lateral direction due to the presence of the elliptic first house part can be prevented, stable vibration performance can be provided by allowing the suspension to support the magnetic circuit part at three points, and generation of metallic fatigue can be minimized because the suspension has the long arms.

[0020]

In a multifunction-type vibration actuator according to ~~claim-5~~ an embodiment of the invention, since distal ends of arms are formed in different shapes and dents corresponding to

a shape of each distal end of the arm are provided in a bottom wall surface of the first house part, the magnetic circuit part can be easily and correctly installed in the cylinder of the second house part by fitting the distal ends of the suspension arm in the dents.

[0021]

In a multifunction-type vibration actuator according to claim 6 an embodiment of the invention, since an external terminal electrically connected to a voice coil is formed by a printed circuit board, and the printed circuit board is installed to the one bottom wall surface of the first house part opposite the other bottom wall surface facing the diaphragm, the necessity of a specific mounting space that may be required when the external terminal protrudes from the housing can be eliminated, keeping the whole actuator compact.

[0022]

Since portable communication equipment according to claim 7 an embodiment of the invention is mounted with a multifunction-type vibration actuator according to one of claims 1 through 6 above described embodiments, the space inside the equipment can effectively be utilized to facilitate assembly of portable communication equipment having high tone quality and output.

On page 5 of the specification, please amend the heading and insert the following just before paragraph 0023:

BEST-MODE FOR CARRYING OUT THE INVENTION

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view showing parts configuring a multifunction-type vibration actuator according to the invention.

FIG. 2 is a back view showing a housing forming the multifunction-type vibration actuator shown in FIG. 1.

FIG. 3 is a cross-sectional view showing the housing in FIG. 2.

FIG. 4 is a top view showing the housing in FIG. 2.

FIG. 5 is a top view showing a housing in which the diaphragm in FIG. 1 is fitted and fixed.

FIG. 6 is a cross-sectional view showing a magnetic circuit part configuring the multifunction-type vibration actuator in FIG. 1.

FIG. 7 is a top view showing a suspension configuring the multifunction-type vibration actuator in FIG. 1.

FIG. 8 is a back view showing the housing equipped with the external terminal in FIG. 1.

FIG. 9 is a cross-sectional view showing an assembled condition of the multifunction-type vibration actuator in FIG. 1.

FIG. 10 is an explanatory view showing a mounted condition of the multifunction-type vibration actuator in FIG. 1.

DETAILED DESCRIPTION

On page 8 of the specification, please amend paragraph 0036, as follows:

The yoke 4a is provided with a maximum diameter part 40 so as to maintain the very small clearance with the cylindrical wall 11 of the second house part 1b. In addition, the yoke 4a is provided with peripheral steps 41 and 42 having incrementally smaller diameters in order to keep the entire weight optimum and a rising peripheral wall capable of incorporating a step part ~~24~~ 43 for fitting the suspension 5, the magnet 4b, and the pole piece 4c.

On page 11 of the specification, please delete paragraph the heading following paragraph 0050 and delete paragraph 0051, as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view showing parts configuring a multifunction-type vibration actuator according to the invention.

FIG. 2 is a back view showing a housing forming the multifunction-type vibration actuator shown in FIG. 1.

FIG. 3 is a cross-sectional view showing the housing in FIG. 2.

FIG. 4 is a top view showing the housing in FIG. 2.

FIG. 5 is a top view showing a housing in which the diaphragm in FIG. 1 is fitted and fixed.

FIG. 6 is a cross-sectional view showing a magnetic circuit part configuring the multifunction-type vibration actuator in FIG. 1.

FIG. 7 is a top view showing a suspension configuring the multifunction-type

vibration actuator in FIG. 1.

FIG. 8 is a back view showing the housing equipped with the external terminal in FIG. 4.

FIG. 9 is a cross sectional view showing an assembled condition of the multifunction-type vibration actuator in FIG. 1.

FIG. 10 is an explanatory view showing a mounted condition of the multifunction-type vibration actuator in FIG. 1.